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Araştırma/ Research Article

STABILIZATION SPLINT THERAPY IN TEMPOROMANDIBULAR JOINT ANTERIOR DISC DISPLACEMENT WITH REDUCTION: A RETROSPECTIVE ANALYSIS

TEMPOROMANDİBULAR EKLEM REDÜKSİYONLU ANTERİOR DİSK DEPLASMANİNDA STABİLİZASYON SPLİNT TEDAVİSİ : RETROSPEKTİF ANALİZ

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ABSTRACT

Objective: The aim of this study was to evaluate the treatment effect of stabilization splint in patients with Temporomandibular joint (TMJ) anterior disc displacement with reduction (ADDwR).

Study Design: This retrospective, multicentered study consists of 31 patients who have TMJ ADDwR according to the Research Diagnostic Criteria and treated with stabilization splint between the years 2009-2011. Maximum mouth opening (MMO), lateral movements, TMJ clicking (positive- negative), pain scores (0–10) at 3rd, 6th months and 1 year follow ups records were evaluated statistically with Wilcoxon and Mann–Whitney U-tests.

Results: None of the patient reported worsening of the symptoms at the end of the treatment period relative to the baseline. Follow-up pain score was found to be significantly low with respect to preoperative pain score ($p<0.05$). The number of patients with joint clicking was also significantly reduced in 3rd, 6th months follow ups. No significant improvement was observed in MMO and right and left lateral excursion in follow up periods.

Conclusion: Stabilization splint therapy is a reversible and conservative treatment method that has beneficial effects in pain and joint clicking in TMJ ADDwR patients.

Keywords: TMJ, splint therapy, anterior disc displacement

ÖZET

Amaç: Bu çalışmanın amacı, Temporomandibular eklem (TME) redüksiyonlu anterior disk deplasmanı (RADD) olan hastalarda stabilizasyon splint tedavisinin etkisinin değerlendirilmesidir.

Çalışma dizaynı: Bu retrospektif iki merkezli çalışma, 2009-2011 yılları arasında araştırma amaçlı tanı ölçütün göre TME RADD rahatsızlığı teşhisi konan ve splint tedavisi uygulanan 31 hastayı içermektedir. Hastaların 3. ay, 6. ay ve 1. yıl takiplerinde alınan maksimum ağız açıklığı, klik sesi (pozitif-negatif),) ağrı skoru (0-10) verileri Wilcoxon ve Mann-Whitney U-testleri ile istatistiksel olarak değerlendirildi.

Sonuç: Tüm hastalarda tedavi sonundaki semptomlar başlangıç duruma göre daha iyi bulundu. Takip edilen ağrı skoru, tedavi öncesi ağrı skoruna göre anlamlı derecede düşük bulundu ($p <0.05$). Ekleminde klik sesi bulunan hasta sayısında 3. ve 6. ay takiplerinde belirgin bir azalma izlendi. Maksimum ağız açıklığı ve sağ ve sol lateral hareketlerde takip periodunda anlamlı bir iyileşme izlenmedi.

Tartışma: Stabilizasyon splint tedavisi, ağrılı ve eklem kliği olan TME RADD olan hastalarda yararlı etkileri bulunan, geri dönüşümlü ve konservatif bir tedavi metodudur.

Anahtar kelimeler: TME, splint tedavi, anterior disk deplasmanı

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INTRODUCTION

Internal derangement (ID) of the temporomandibular joint (TMJ) defines an abnormal relation of the articular disc to the mandibular condyle and the articular eminence.[1,2] Anterior disc displacement with reduction (ADDwR) is a common seen subtype of ID characterised by joint pain and clicking. In ADDwR, the intra-articular disc has slipped forward and mouth opening is accompanied by a clicking or popping sound. This percussive sound is produced as the condyle passes over the posterior band and returns to a normal relation with the disc. Patients with ADDwR may also be asymptomatic or they may have associated symptoms of joint pain and limitation of mouth opening.[3]

Occlusal splints are used for the management of temporomandibular joint disorders (TMD), although their mechanism of action remains controversial. Regardless of its mode of action, some randomized clinical trials and literature reviews have documented its therapeutic effectiveness.[4-6] Splint insertion, is likely to cause a shift in the position of the minimum intra-articular distance (and therefore of the contact stress areas), when habitual closure as well as sliding movements occur with high force.[7] Lower levels of intra-articular pressure was measured in patients wearing interocclusal appliance.[8,9]

Stabilization splints are the most common used appliances in TMJ ID patients which has a flat surface occluding with the opposing dentition.[10] Stabilization splint enables patients to move freely from maximum intercuspation and provide a gnathologically stable occlusal environment.[11] Occlusal splints can be used either only at nights or in day time. Most of the splint studies were focused on nocturnal bruxism, and did not differentiate between the clenching and grinding forms of the disorder, although clenching, which occurs mainly during the daytime, has been reported to be associated with higher risk for jaw pain.[12] One of the main outcome of splint therapy is that they assist patients to recognize and reduce clenching and tooth-grinding behaviors.[3] It can be argued that loading inside the TMJ may be reduced or redirected by the use of an occlusal appliance. This may occur because of a reduction in the amount and intensity of nocturnal muscle activity or it may be due to the condylar loading area being shifted elsewhere.[13]

The aim of this retrospective study is to evaluate the short and long term benefical effects of stabilization splint therapy on TMJ ADDwR patients

MATERIAL AND METHODS

This study was a retrospective analysis that reviewed the medical records of 31 patients that diagnosed and treated at two centers, Departments of Oral and Maxillofacial Surgery, Faculties of Dentistry at Ondokuz Mayıs University, and at Erciyes University, from. The examination protocols used in both centers were the same and, patient inclusion criteria was as follows; *1*) first visited the clinic between 2009 to 2011 *2*) diagnosed with TMJ ID in ≥ 1 joint according to Research Diagnostic Criteria for TMD Axis I diagnosis of disc displacement with reduction (Group IIa)s[12] *3*) had clinical follow-up available at least 3 months after the first visit; *4*) had received no treatment before and during the follow-up period;

The clinical data were collected according to the following criteria:

Clicking: Opening and closing clicks, examined by bilateral digital palpation.

MMO: Measured with a millimeter ruler with additional force produced by the examiner in an attempt to exclude the influence of masticatory muscle pain on mouth opening.

Lateral movements: Horizontal distance between the midpoints of the upper and lower incisors during left and right excursions.

Deviation of the mandible: Distance between the midpoints of upper and lower incisors during MMO.

TMJ pain at the preauricular region during mandibular movements: The patients were asked to rate their pain on a Visual Analog Scale (VAS). '0' indicated no pain and '10' severe pain.

In all cases, stabilization splint therapy was applied. Patients received a 2 mm hard acrylic, full-arch maxillary stabilization-type splint with flat occlusal surfaces, and occlusal contacts in centric occlusion for all opposing teeth. Patients were used splint 24 hrs/day except for oral hygiene and at mealtimes for

at least 3 months. During the period of wearing the splint the patients were regularly checked so that it could be observed that the splint was successfully accepted. All patients instructed with home and self care suggestions.

MMO, TMJ sounds (positive or negative) and VAS pain scores (0–10) were recorded at each appointment. The outcome data were collected at 3rd, 6th months and one year after the treatment.

Statistical analysis

Documentation and evaluation of the data were performed using a data processing program, SPSS/PC Version 16.0 for Windows (SPSS Inc., Chicago, IL, USA) Wilcoxon Signed ranks test was used to compare pre and post treatment differences. The statistical significance level was determined as $p<0.05$ and the results were expressed as the median (min-max) of the values.

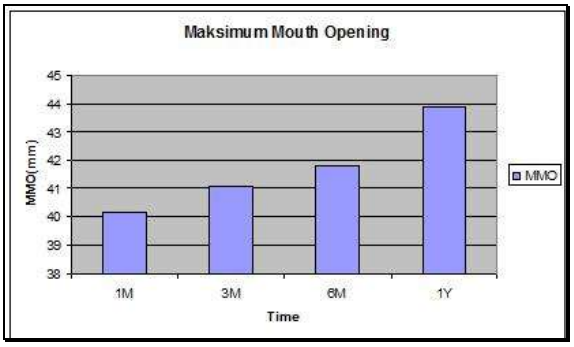

Figure 1. Mean maximum mouth (MMO) opening of the patients 1,3, 6 month and 1 year after splint insertion.

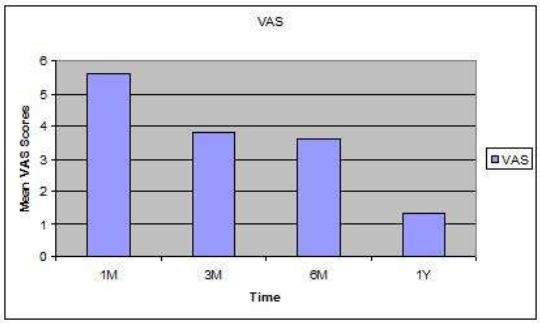

Figure 2. Mean Visual Analog Scale (VAS) scores of the patients 1, 3, 6 month and 1 year after splint insertion.

RESULTS

The present study included 31 TMD patients 26 women and 5 men. The patient's age were ranged from 16 to 57, with a mean of 31 ±.12. They were all diagnosed as TMJ ADDwR at least in one side, a total of 7 with unilateral and 24 with bilateral. Background data, including distribution of gender, age, duration of symptoms, uni or bilateral changes, are presented in Table I. Thirty-one patient completed the study over 3 months period, 20 patients over 6 months period and 10 patients over 1 year. The pre-treatment and 3, 6, and 12 months follow up mean VAS scores, MMO, lateral excursions and the presence or absence of joint sounds were presented in Table 2. No patient reported worsening of the symptoms at the end of the study relative to the baseline. No significant improvement was observed with respect to MMO at 3rd, 6th and 12th months follow ups (p=0,45;0,23;0,28 respectively); right and left excursions at 3rd, 6th and 12th months follow ups (p=0,95 and 0,87;0,19 and 1;0,65 and 0,7 respectively). Mean VAS scores were found to be significantly reduced at 3rd, 6th and 12th months follow ups (p 0,001; 0,001 and 0,002 respectively). Number of patients with joint clicking was significantly reduced when compared to the pretreatment at 3rd and 6th months (p=0,004; p=0,016). No significant difference was found between pretreatment and 1 year follow up with respect to joint clicking (p=0,250).

Table 1. Demographic data of the patients. TMJ:Temporomandibular Joint; ID: Internal derangement

Gender	Female	26
	Male	5
Age(mean)	31,06 ±12,02	
Symptom duration	2-5 month	10
	6-12 month	7
	12-24 month	3
	> 24 month	7
TMJ ID	Unilateral	7
	Bilateral	24

Table 2. Pretreatment and outcome datas of patients at 3rd, 6th and 12 th months. VAS: Visual Analog Scale, pain scores (0–10)

	Pretreatment n=31	3rd month n=31	6 th month n=20	12th month n=10
Maximum Mouth Opening (mm) (Mean±SD)	40, 2±7,8	41,1±5,9	41,8±6,3	43,9±6,6
VAS (mean±SD)	5,6±2,4	3,8±2,8	3,6±2,8	1,3±1,9
TMJ sounds (number of patients, precentage)	26(83%)	18(58%)	11(55%)	6 (60%)
Right lateral excursion (mean±SD)	8,6±2,4	8,7±2,2	8,7±2,5	9,6±1,6
Left lateral excursion (mean±SD)	8,9±2,9	9,7±2,6	9,3±2,7	9,9±2,1

DISCUSSION

In clinical practice, oral splints are one of the most common treatment modalities for TMJ ID.[15] Despite its extensive use, their mechanisms of action remain controversial. The major objectives of wearing a splint are to reduce mechanical loading on the articular surfaces and to address hyperactivity of the masticatory muscles.[16] A great majority of the authors suggest that the stabilization appliance is more effective in alleviating symptoms and signs in patients with TMD of mainly myogenous origin.[17,18,19] Kurita et al reported that a displaced disc significantly decreased the success rate of the stabilization splint therapy.[18] However, others have found significant improvement with stabilization splint therapy in patients with TMJ ID.[20,21,22] Consistent with previous investigations who recommend splint therapy in patients with TMJ ID,[21,22] our results showed that the use of stabilization splint resulted in significant improvement in symptoms of patients by reducing pain and clicking in the TMJ. However, some of clicking returned during one year follow up period.

Mechanical stresses in TMJ is thought to be provoked by masticatory muscle hyperactivity in malocclusion, dental irritation, physical stresses, anxiety, and bad oral habits.[23] It has been postulated that during clenching, as well as jaw movements, forces between the condyle and the articular eminence are compressive and tangential in nature and undergo different magnitude levels.[4,24,25] Excessive mechanical stress to TMJ may damage tissues directly (i.e., direct mechanical injury) or indirectly (i.e., hypoxic-reperfusion injury or neurogenic inflammation).[26,27] Nitzan reported that free radicals may be produced after excessive overloading of the joint, thereby degrading hyaluronic acid.[28] A splint removes the influence of teeth on the joint position by slight distraction of the joint, which in turn enables the tissue to heal.[19] The appliance may reduces the mechanical stress that generate free radicals leading to degenerative changes in articular surfaces of TMJ. In our opinion use of stabilization splints have beneficial effects not only in symptomatic relief but also in the healing of the joint structures and regression of the disease.

Some authors suggest to use of the anterior repositioning occlusal splints in TMJ ID patients especially in ADDwR.[29,30] However, it has the disadvantage of leading irreversible changes in the condylar position.[31] We preferred the use of stabilization splint which has no irreversible effects on occlusion and condyle position, and is well excepted by the patients. It has been reported that the optimal duration of time to evaluate occlusal splint therapy is 90 days.[32] In this study, the patients used the stabilization splint for at least 90 days. Patients, who have clenching, grinding and bruxism behavior, continued to use the appliance at nights with close follow up. Although our study is not a randomized double-blind controlled trial, retrospective trials are also necessary to evaluate efficacy of the different therapies for TMJ ID.

Several imaging studies have investigated the effects of stabilization therapy on TMJ disc position.[33,34,35] A great majority of studies reported that the stabilization splint therapy has beneficial effects in reduction of pain, joint loading and improving mandibular function rather than repositioning the disc in patients with TMJ IDs.[33,36] Tough the goal of the splints is not to re-establish a "normal" disk-condyle relationship, we focused on the

effects of stabilization splint on clinical symptoms of TMJ ADDwR.

The beneficial effects of stabilization splint therapy on myofacial pain are well accepted in the literature[17,38] However, the efficiency of splint therapy on ID patients remains controversial. Clicking and pain are the most common signs and symptoms of ADDwR patients.[11] Few studies have reported the use of stabilization splints for the treatment of clicking of the TMJ.[33,36] In our study, significant improvement was observed both in pain and joint clicking at all follow up periods. In agreement consistent with our results Conti et all found improvement in joint noises between subjects wearing oral splints and subjects in no-treatment group.[39] They concluded that the improvement observed for the presence of clicking probably is due to morphological alterations and remodeling in the joint structures over time (disk, ligaments and retrodiscal tissues), diminishing the physical obstruction for the condyle translation and, consequently, decreasing the sound. With regard to MMO, we found no significant difference between the baseline and the measurements at 3rd, 6th and 1 year. It is probably due to the fact that most patinets with ADDWR have normal range of MMO. In this study pretreatment mean MMO was calculated as 40,2 which means that the limited mouth opening was not the main complaint for our patient group.

In conclusion, the majority of TMJ ADDwR signs and symptoms improve to an acceptable level with only reversible therapy. Our results suggest that stabilization splint theraphy is an effective treatment modality for TMJ ADDwR patients. Further prospective studies are needed to confirm the effectiveness of stabilization splint therapy compared to other non-invasive therapies.

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